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ABSTRACT

The Oak Ridge Associated Universities (ORAU) of Tennessee and the Nuclear Division of the Union Carbide Corporation established an industrial training program called Training and Technology (TAT) which was conducted at the Oak Ridge Y-12 plant. TAT instructors were provided by the regular work force of Union Carbide while ORAU provided the administration, planning, program development, trainee service, job-related education, and job placement aspects of the program. A brief description of the five training areas offered in the program is presented: welding, machining, industrial electricity, physical testing, and mechanical operations. The job-related education provided in each of the occupation areas includes shop theory, blueprint reading, shop mathematics, and science. In addition, safe working practices and industrial hygiene are also stressed. Basic information about the program such as enrollment, housing, location, and extracurricular activities are provided. Personal experiences from two students who participated in the TAT program are included. (Author/EC)

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# TAT

In 1965, Oak Ridge Associated Universities concluded from a survey it had conducted that " . . . millions of Southerners are unable to make reasonable use of their potential for work mainly because of inadequate education and training." As a result, ORAU, in cooperation with Union Carbide Corporation, Nuclear Division, established an unusual industrial training program called Training and Technology. Two things make Training and Technology (TAT) notable:

*The training takes place at the Oak Ridge Y-12 Plant, a modern industrial complex with up-to-date equipment and facilities. (Y-12 is a U.S. Energy Research and Development Administration plant operated by Union Carbide.)

*Technical instruction is given by supervisors and craftsmen who work at Y-12 and

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What makes TAT
so outstanding is
the modern equipment,
a fine technical
staff, and the
industrial atmosphere.



A joint endeavor of Oak Ridge Associated Universities and
Union Carbide Corporation, Nuclear Division, with the support of the
Energy Research and Development Administration

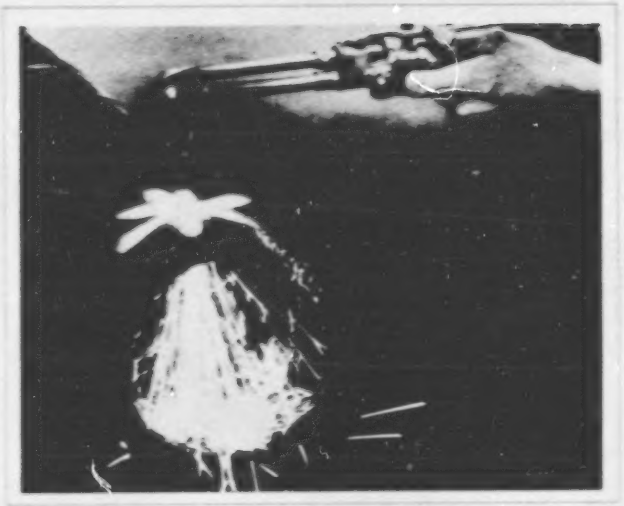
are assigned to the TAT program.

Initial support for the program, whose purpose is to train the unemployed and unskilled, and to upgrade the underemployed, was from the Department of Labor under the Manpower Development Training Act. When that act was ended in 1974, it was replaced by the Comprehensive Employment and Training Act (CETA). Most of today's training at TAT is paid for with CETA funds through local agencies.

Union Carbide reaches into its regular work force for the highly skilled craftsmen and craft supervisors who serve as TAT instructors. ORAU provides administrative services and takes responsibility for long-range planning, program development, trainee services, job-related education, and job placement. This cooperative effort has made it possible for more than 3,000 persons to complete the training—and more than 95 per cent of them have been placed in well-paying industrial jobs.

Union Carbide reaches into its regular work force for the highly skilled craftsmen and craft supervisors who serve as TAT instructors.

Almost anyone with determination and the necessary physical and mental abilities can take advantage of TAT to prepare for a quality job in industry. Training isn't restricted to persons sponsored by CETA or other agencies and organizations. One can enter TAT through Oak Ridge High School's adult-education program and pay for his own training; private industries also sponsor trainees through the adult-education program.



Five training areas are currently open for enrollment: welding, machining, industrial electricity, physical testing, and mechanical operations. Since TAT is flexible and geared to meet the demands of industry, other training areas can be added or dropped as demand dictates. Courses in glassblowing, drafting, and chemical-technician training, for example, were dropped when demand in these fields fell. The job-related education provided in each of the occupational areas includes shop theory, blueprint reading, shop mathematics, and science.

Welding

The heart of the TAT welding course is the welding laboratory, where trainees get "hands on" experience. The average student spends nearly 80 per cent of his training time in the laboratory. The remaining time is devoted to welding theory, blueprint reading, and shop mathematics.

Two-thirds of the welding-laboratory schedule is spent learning shielded metal arc welding on both plate and pipe, since most industrial welding is of this type. The students also learn oxyacetylene burning and welding, gas-shielded tungsten arc welding, and gas-shielded metal arc welding.

Because the teacher-trainee relationship is vital in welding, feedback to the trainees is stressed, as well as demonstrations, practice sessions, and performance tests. The need for speed and high quality of work in industry are emphasized.

Trainee test welds are physically tested to assure quality and to prepare the trainee for certification tests, which the TAT staff conducts in strict accordance with the American Society of Mechanical Engineers code. However, ASME certificates are not issued, since individual employers are required to test and certify employees for specific processes at the time of employment. Areas of certification and the number of hours completed on specific welding assignments are indicated on the diploma that TAT graduates receive.

Trainees progress at their own speed.
Projects are designed to include
enough repetition to ensure maximum learning,
and a variety of setups and operations
promote versatility.

### Machining

The TAT machining course teaches students to set up and operate a variety of metal-removal machines. As in other TAT courses, about 70 per cent of a trainee's time is spent in the shop. The course has two sections: lathe and milling machine. A trainee spends 13 weeks on the lathe and related equipment—engine lathe, duplicator lathe, and vertical turret lathe—under a shop foreman's supervision. He spends the next 13 weeks on the milling machine and related equipment—vertical mill, horizontal mill, shaper, surface grinder, radial drills, and saws. In addition to the shop foreman, each section has two journeymen to give individual instruction.

Trainees progress at their own speed. Projects are designed to include enough repetition to ensure maximum learning, and a variety of setups and operations promotes versatility. To encourage self-reliance, trainees are taught to set up, lay out, fabricate, and inspect their own work.

### Industrial Electricity

The Industrial Electricity course prepares trainees for entry-level work, with emphasis on wiring and power distribution. The student spends about 55 per cent of his time in classroom study, using textbooks, blueprints, schematics, and blackboard diagrams. Another 30 per cent of his time is spent in wiring motors, generators, transformers, and controls, and running conduit and wiring; part of this time is devoted to commercial and house wiring.

He or she also studies the design of lighting systems, power-distribution systems, and transformer and induction-motor windings, and learns fuse and circuit-breaker applications. The use of electric meters is explained, and all the trainees wire and test various types of motor-control circuits.

As in all training areas, the student spends about 15 per cent of his time in work-related courses taught by other instructors. The industrial electricity course includes weekly instruction in electrical safety.

### Physical Testing

The techniques of physical testing are indispensable to designers, engineers, manufacturers, and consumers. As a result, technicians and inspectors trained in physical testing are in great demand by industry, and the TAT course in physical testing is geared to meet that demand.

Physical-testing technology includes nondestructive and destructive methods of detecting holes, cracks, or breaks in parts or materials to assure their quality and performance levels.

In nondestructive testing, the TAT student learns to use ultrasonic, radiographic, eddy-current, liquid-penetrant, and magnetic-particle techniques. In destructive testing, the students learn how to use hardness, tensile, compression, and impact methods.

Since most students in the physical-testing program are not familiar with the subject when they enroll, the course begins with basic information that includes new terminology. About 15 per cent of the course is devoted to physical-testing theory; 30 per cent to related subjects such as science, mathematics, and communications; and 55 per cent to laboratory practice. In the laboratory, trainees use a variety of industrial equipment to gain "hands on" experience in the generalized and specialized work they will be called upon to perform in industry.

### Mechanical Operations

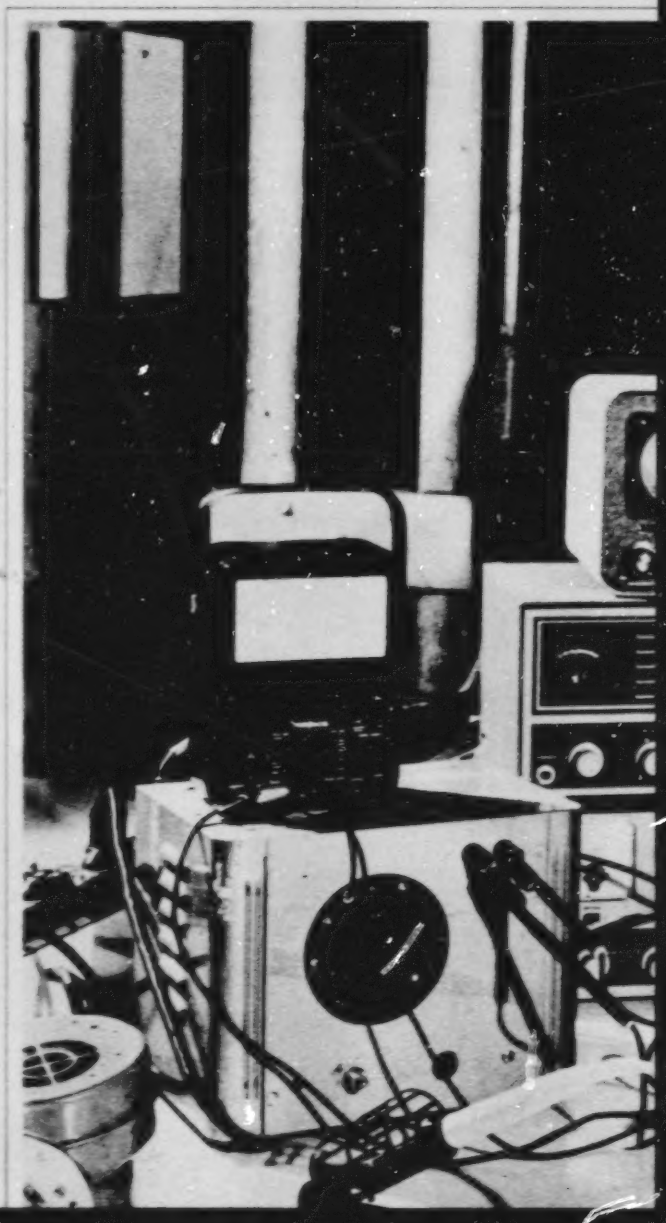
The curriculum for the mechanical and process operations course includes five basic areas of study:

*Sheet-metal layout* describes different types of sheet metal and teaches the application of geometrical principles to the fabrication of elbows, branches, joints, and transition pieces.

*Pipe fitting* teaches methods of installing pipe systems that carry liquids or gases needed for sanitation or industrial production. Trainees also study maintenance of existing pipe systems and installation of plumbing fixtures.

*Welding* teaches the skills needed to do pipe-fitting and millwrighting operations. The instruction is less detailed than that given in the regular welding course.

*Millwrighting* teaches methods of moving and installing heavy industrial equipment, including its reassembly and alignment. Trainees learn to fit bearings, align gears, and attach motors and connection belts, as well



as to construct concrete foundations and platforms, and to fabricate metal frameworks on which machinery is to be mounted.

Generally, about 16 per cent of the course is sheet-metal layout, 32 per cent operations, 32 per cent pipe fitting, 4 per cent welding, and 16 per cent millwrighting. However, when a trainee's sponsor or prospective employer desires a specialized curriculum, ORAU can arrange such changes.

### Transition

What makes TAT so outstanding is the modern equipment, a fine technical staff, and the industrial atmosphere. But TAT trainees do more than learn to use machinery. Regardless of the training area they select, all trainees attend job-related classes to deepen their understanding of the industrial world they will enter. In addition to shop-oriented mathematics, science, and blueprint reading, safe working practices and industrial hygiene are stressed, particularly in the early part of the

# Here, there's no reason why a person shouldn't be able to make it.

"When a young person doesn't have enough schooling or education, life can be hard. That's why I think this program is so great—it gives a person a chance to better himself and have a more secure life."

The speaker is Larry Gooch, 23, of Nashville, who is now in Oak Ridge enrolled in Training and Technology.

As a member of the TAT mechanical operations group, Larry is receiving the first real job training he's ever had. He works eight hours a day, five days a week. When he completes the course, he looks forward to getting a job as a pipefitter making more than twice the money he made before.

Like most TAT trainees, Larry's training is being paid for under the Comprehensive Employment and Training Act (CETA), which returns federal funds to local agencies who act as prime sponsors. Larry is being sponsored by the Nashville (Tenn.) CETA.

Larry, an earnest, soft-spoken young man, is eloquent about TAT.

"It's probably the best training in the United States," he says. "Here, there's no reason why a person shouldn't be able to make it. You work at your own pace in the field you have chosen, and the teachers are the best you can get. I'm not only learning a good trade, I'm enjoying it!

"Everything is going just as I hoped," Larry says. "I'm learning step by step, and I haven't had any trouble. I haven't missed a day, and I don't intend to. That's the only thing that can keep you from making a success of your training—missing days. If you miss too many, you can be terminated, and I'm not going to lose out on **that** account!"

Larry's homework occasionally interferes with his social life, but that doesn't bother him.

"I get to play softball and basketball occasionally," he says, "but mostly I watch TV and study my books. Right now, becoming a good pipefitter is more important than what I do in my spare time." TAT

program. Safety specialists at the Y-12 Plant hold frequent seminars in these subjects for the trainees.

Local union representatives are invited to the plant to discuss the role of unions in modern industrial organizations. And in the latter half of the program, job-development skills such as interviewing techniques, test-taking, application-writing, and job evaluation are emphasized.

Remedial coaching in the three R's is provided for trainees who need it, and those who are not high-school graduates can study for the General Equivalency Diploma examinations.

On the personal side, TAT staff members provide informal assistance with a variety of problems, including financial difficulties, housing, transportation, and other matters that may affect the student's success.

### How to Enroll in TAT

Enrollment in the TAT program is open to all adults with a working knowledge of English and mathematics and the physical ability to perform industrial work safely. A high school diploma is not required. Trainees in the physical testing course must be 18 years old at the time of enrollment; for the other training areas, they must be 18 at the time they graduate.

Full information and preliminary application material can be obtained by writing:

Training and Technology
Oak Ridge Associated Universities
P. O. Box 117
Oak Ridge, Tennessee 37830

Upon receipt of the application form by TAT and approval from the applicants' sponsors—assuming space is available—applicants are usually invited to visit the Oak Ridge training site to discuss the courses best suited to their aims and abilities. The application process can be completed at that time.

Trainees must be able to attend classes

My father thought it was unusual for a woman to be a welder, but I told him I'm going to be good at it, and he didn't object.

Cathy L. Smith found over the past two years just how difficult it is to keep a family going on what she could earn from the office jobs she is suited for. When Cathy, who is divorced and has two children, heard about TAT at the local employment office, she applied and was accepted.

Today she's at the Oak Ridge Y-12 Plant studying to be a welding-inspection technician, a new career that she believes will be personally and financially rewarding.

Graduates of the welding-inspection technician course that Cathy is in will help meet the demand in construction, energy, and other industries for persons trained to maintain rigid quality control in welding procedures. The TAT training time is usually six months. But Cathy, who is 24, is part of a new program that begins with the six-month course in physical testing, followed by three months of hands-on work in welding techniques.

Following two months of studying the mechanical properties of metals, Cathy will spend two months learning to use ultrasonics to detect welding flaws. This will lead to two months of radiographic testing. Finally, she'll spend three months learning to weld and to use welding-inspection techniques.

The cost of Cathy's training, like most trainees, is being paid under the Comprehensive Employment and Training Act (CETA), which returns federal funds to local agencies who act as prime sponsors.

What does Cathy think of the switch from office worker to welding inspector? "Absolutely great!" she says. "This is the

most interesting work I've ever done. There are so many applications of nondestructive testing that you can do something different every day for six months. And they teach you so much in such a short time!

"The instructors are really good," Cathy says. "There's a real one-to-one relationship, and they're always ready to give individual instruction. When you have a good attitude and do well, the instructors give you an extra effort. As a result, I'm enjoying the work more than anything I've ever done."

She doesn't think she'll have much trouble getting a good job. The techniques of physical testing are indispensable to designers, engineers, producers, manufacturers, and consumers. Good welding inspectors are in great demand by industry, and TAT graduates in physical testing and its applications are qualified for such positions.

"The TAT training gives you a real edge when you apply for a job," Cathy says. "For example, when you go to work in some industries, they send you to school to learn quality control. We get the necessary training right here.

"Another nice thing," she says, "is that you're not restricted in your choice of jobs. You can go with a large industrial firm and do maybe one or two things. Or you can become an expert and use all your destructive and nondestructive testing techniques for a small company.

"My father thought it was unusual for a woman to be a welder," she says, "but I told him I'm going to be good at it, and he didn't object. And the children, Danny, 6, and Amy, 4, don't worry about it at all. Danny did ask me if I was going to have to wear 'that hat'—a welding mask—all the time. But they just figure mommy's going to school every day, and that's that. If we work rotating shifts, there's a good day-care service available, so there's no problem there, either."

As for the future, Cathy isn't worried.

"If there's one thing I've learned at TAT," she says, "it's that you can't fail if you do your best." TAT

If there's one thing I've learned at TAT, it's that you can't fail if you do your best.

on a regular 40-hour-week schedule. Preference is given to applicants who most need the training, and who are able to benefit from it.

### Housing

Trainees unable to commute to the Oak Ridge Y-12 Plant can find furnished and unfurnished apartments, dormitories, and rooming houses in Oak Ridge.

### Location

Oak Ridge, which is located 20 miles northwest of Knoxville, has a population of about 28,000.

The Y-12 Plant, where the training is conducted, is near the center of the Oak Ridge area, about a mile from the residential section. It is one of the largest and most versatile of the Energy Research and Development Administration's facilities, and carries out production and development operations vital to the nation's energy, defense, and space programs. It has high performance standards and unique production capabilities.

### Extracurricular Activities

East Tennessee is noted for the beauty of its many lakes, rivers, and mountains. Oak Ridge is only 60 miles from the Great Smoky Mountain National Park and the popular resort town of Gatlinburg at the park's entrance. There are seven state parks and two ski resorts within easy traveling distance, and the city is surrounded by Tennessee Valley Authority lakes that provide ample boating, fishing, swimming, sailing, camping, and water recreation. TVI

**The Manpower Development Division** of Oak Ridge Associated Universities seeks to use a scientific approach to the efficient and effective use of human resources. The division has two primary programs:

Training and Technology, an industrial-based skill and technical training program.

Manpower Research and Development, a program of research and analysis on the manpower aspects of the energy problem.

**Oak Ridge Associated Universities** is a private, nonprofit association of 43 colleges and universities in the South. It conducts programs of research, education, information, and human resource development for a variety of government and private organizations. It is particularly noted for its leading work in the development of radiopharmaceuticals and other nuclear medical techniques, for its role in training researchers in the use of radioisotopes, for its public education programs, and for its influence on the development of science in the South. In 1976, ORAU will celebrate its 30th anniversary as a pioneer among corporate university management groups in the United States.

**Union Carbide Corporation** has been involved in the national energy program since the early days of World War II. Through its Nuclear Division, the corporation now operates four major facilities for the Energy Research and Development Administration: gaseous-diffusion plants in Oak Ridge and Paducah, Kentucky; the Oak Ridge Y-12 Plant; and Oak Ridge National Laboratory.